

REMARKS

Claims 1-28 are pending in this application. Reconsideration and allowance of the present patent application based on the following remarks are respectfully requested.

REJECTIONS UNDER 35 U.S.C. § 102

Claims 1-6, 14, 16, 18, 19 and 21-23 were rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 5,343,292 to Brueck et al. ("Brueck"). Applicant respectfully traverses this rejection.

In addition to the Remarks provided in the Request for Reconsideration filed August 13, 2007, Applicant would like to further provide the following additional remarks in response to outstanding rejection under 102(b).

Specifically, Brueck discloses that the diffraction grating on the wafer is illuminated with a pattern that has a different periodicity. The use of a pattern with a different periodicity function is what acts to create a Moire-like effect or interference/fringe pattern. (*See, e.g.*, Abstract and column 3, lines 40-47 of Brueck). The pattern is then recorded, for example, by using a camera (e.g., TV camera 23 of Brueck), and analyzed.

The use of the Moire principle in Brueck ensures that the recorded pattern (e.g., by a camera) is very sensitive to the wafer position. That is, in the Moire principle there is a large amplification factor: a small wafer displacement results in a large Moire pattern shift. This amplification factor is dependent on the *difference in periodicity* between the wafer grating and the illuminating light. To measure this, Brueck captures an image of the pattern with the camera, not merely measuring amplitude, as it is the pattern and more importantly phase differences in the pattern that provide the desired information.

For example, when using a camera to measure a displacement of a pattern in one direction (e.g., the X-direction), a one-dimensional camera (e.g., a camera which views a row of a large number of photo-sensitive pixels) may be used. After capturing the light/dark pattern using the camera, the phase of the obtained fringe pattern may be determined as a direct measure of the alignment between the two patterns. (*See, e.g.*, column 2, lines 44-67 and column 4, lines 4-10 of Brueck). The phase is the measure for the relative position, i.e., difference in periodicity, between the illuminating pattern and the grating on the wafer.

Claim 1, however, recites a measurement device comprising, *inter alia*, "a projection system configured to project an image of the first pattern onto the second pattern; and a detector configured to measure an amplitude of at least one order of a diffraction pattern

resulting from an interference of the second pattern and the projected image.” As noted above, Brueck discloses monitoring the phase of the fringe pattern as a direct measure of the alignment between the two patterns. Therefore, Brueck fails to disclose measuring an *amplitude* of at least one order of a diffraction pattern as recited in claim 1.

For example, in the present application, one outcome includes the fact that the periodicity of the illuminating light is the same as the periodicity of the grating on the wafer. Thus, in order to provide a measurement, the relative position of the diffraction pattern is detected by using a detector (e.g., a photo-sensitive detector) that measures the amplitude [of one of the diffraction orders]. (*See, e.g.*, paragraphs [0066] and [0068] of the present patent application). Thus, in the present patent application, neither phase detection nor a camera is required. (Rather, insensitivity to parameters like wafer reflection and illuminating light power may be achieved by simultaneously measuring an order that is (nearly) insensitive to the relative position of wafer with respect to incident light, for example.)

Also, the present patent application provides a method for qualifying the overlay performance of a lithographic machine (rather than a method to align a wafer to a reticle during production). More specifically, it is one goal of the present invention to accurately measure the overlay between a mask plate and a wafer plate. To do such, it is noted that it is desirable to avoid disturbance or use of the Moire pattern and therefore a similar periodicity for the patterns is used (i.e., so there is no Moire effect). (*See, e.g.*, paragraph [0058] of the present patent application). Therefore, the present patent application relies on the presence of a “phase grating” on the wafer. (*See, e.g.*, paragraphs [0077]-[0078] of the present patent application).

For at least the above reasons (in addition to the remarks in the Request for Reconsideration dated August 13, 2007), Brueck clearly does not anticipate claims 1-6, 14, 16, 18, 19, and 21-23. Applicant therefore respectfully submits that the claims are allowable and that the rejection under 35 U.S.C. 102(b) be withdrawn.

Applicant respectfully requests that the 35 U.S.C. 103(a) rejection of claims 7, 15, 20 and 24 in view of Brueck be withdrawn and that the claims be allowed.

Additionally, Applicant respectfully requests reconsideration and withdrawal of the rejection of claims 8-13 and 25-28 under 35 U.S.C. 103(a) in view of Brueck and Takata.

The rejections having been further addressed, Applicant respectfully submits that the application is in condition for allowance, and a notice to that effect is earnestly solicited.

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If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

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Respectfully submitted,

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